

Nature-Based Solutions to Flooding, Drought, and Groundwater Declines

Bryan Hummel

Life Scientist

EPA Region 4

Austin Adaptation Workshop

November 06, 2019

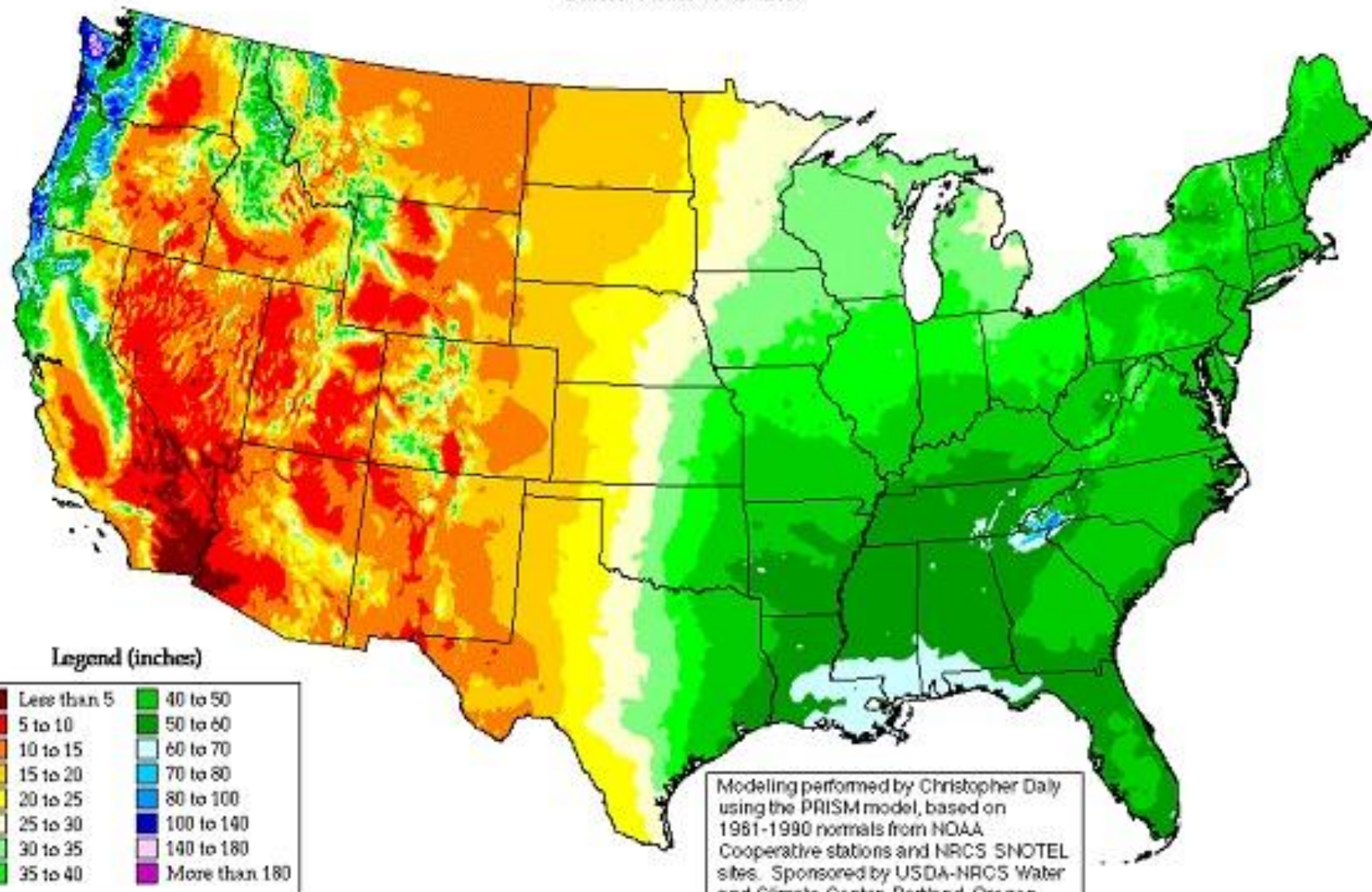




Jeff Cohen
MOONSHINE IMAGES

Annual Average Precipitation

United States of America



Period: 1961-1990

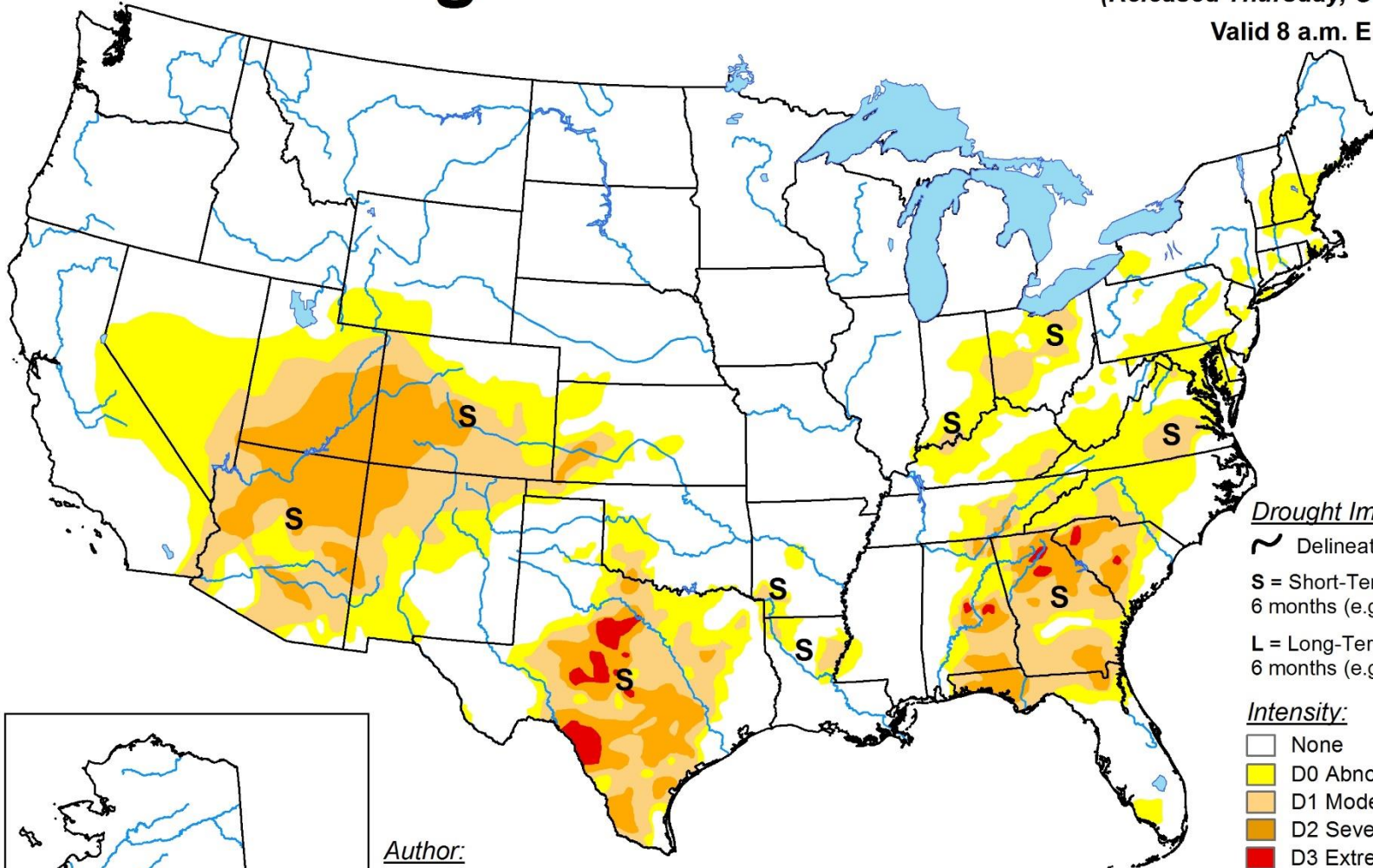
Modeling performed by Christopher Daly using the PRISM model, based on 1961-1990 normals from NOAA Cooperative stations and NRCs SNOTEL sites. Sponsored by USDA-NRCS Water and Climate Center, Portland, Oregon.

Oregon Climate Service
George Taylor, State Climatologist
(541) 737-5705

U.S. Drought Monitor

October 29, 2019
(Released Thursday, Oct. 31, 2019)

Valid 8 a.m. EDT



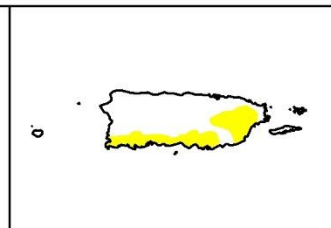
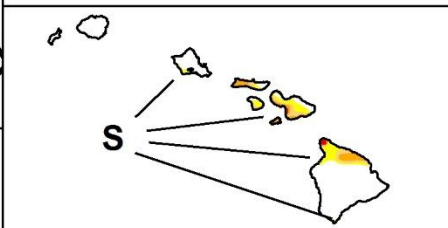
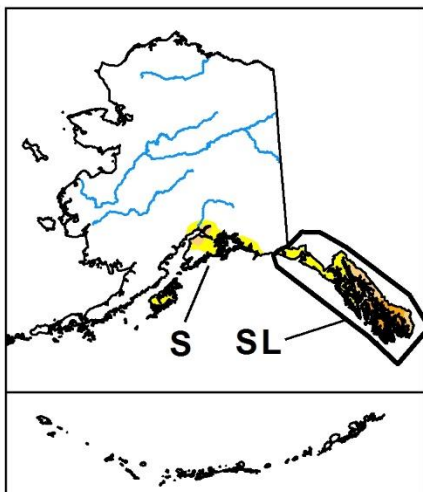
Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:
David Simeral
Western Regional Climate Center



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



droughtmonitor.unl.edu

Hurricane History

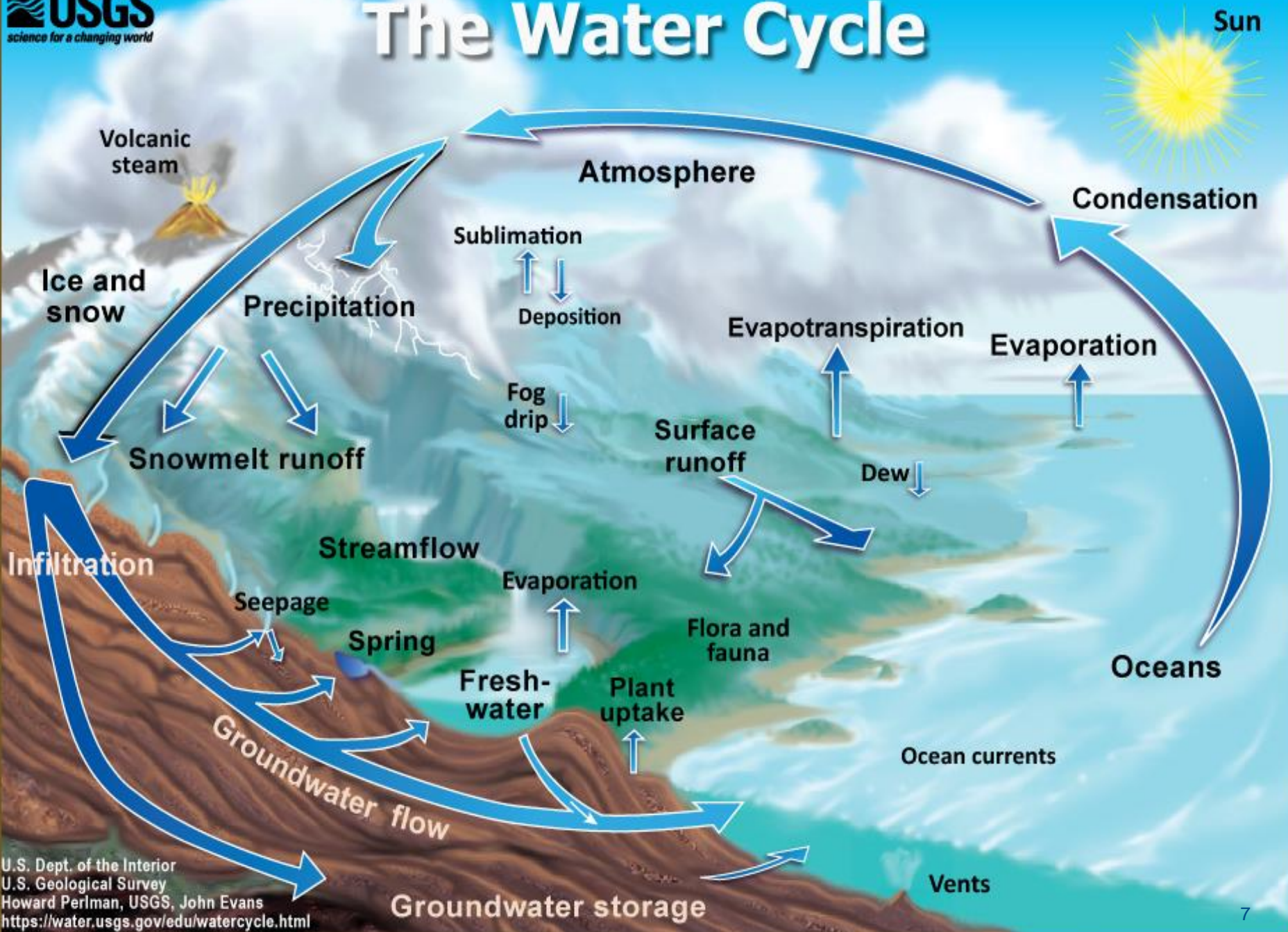
Data from 1949 in the Pacific, from 1851 in the Atlantic



This map shows the tracks of all known North Atlantic and Eastern North Pacific hurricanes, covering the period from 1851-2013 in the North Atlantic and from 1949-2013 in the Eastern North Pacific.

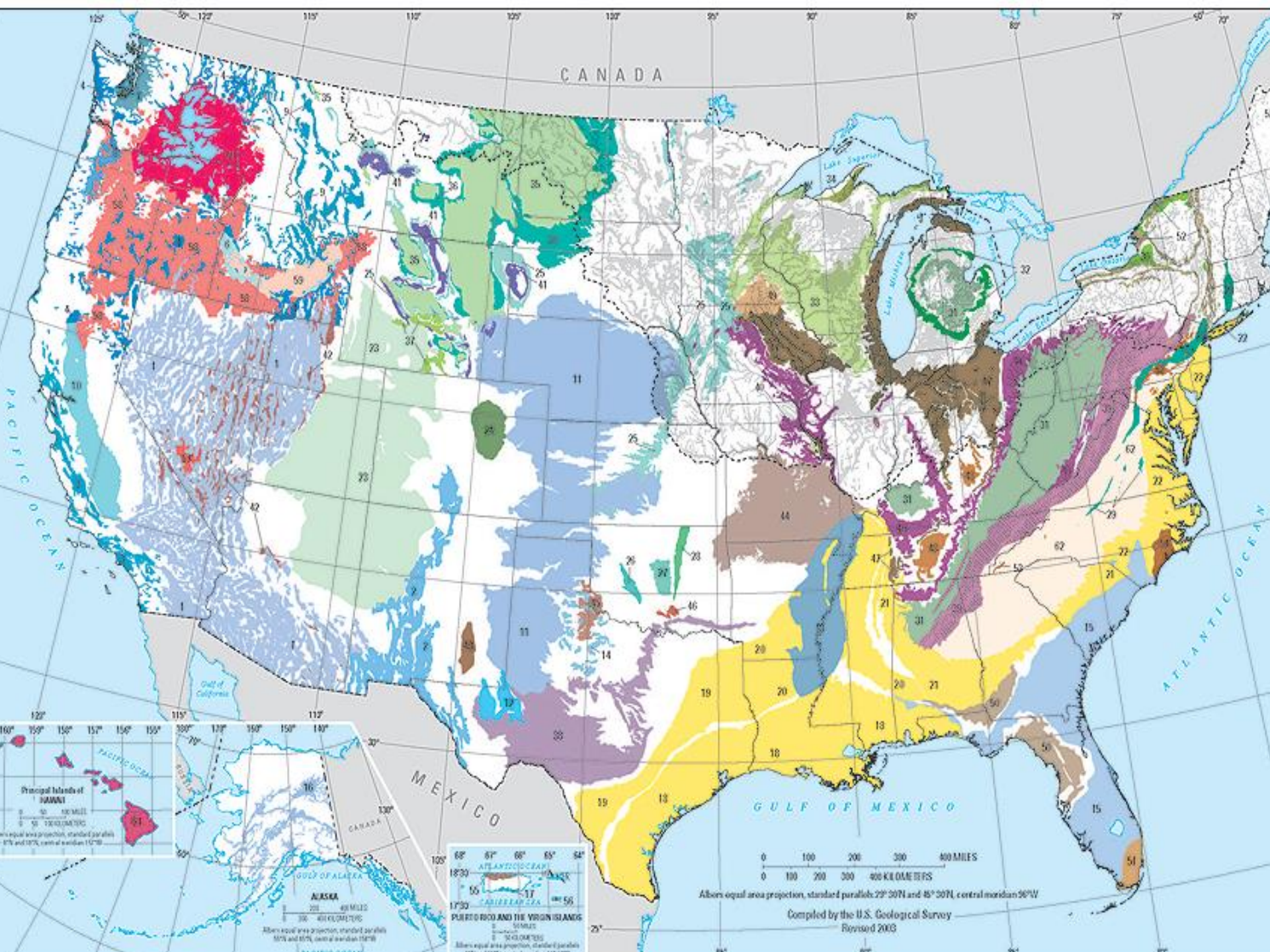
- Extratropical, Remnant Low, Wave
- Tropical Cyclone

The Water Cycle



Rainfall Enters Rivers

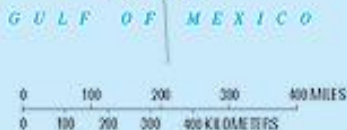




CANADA

PACIFIC OCEAN

ATLANTIC OCEAN

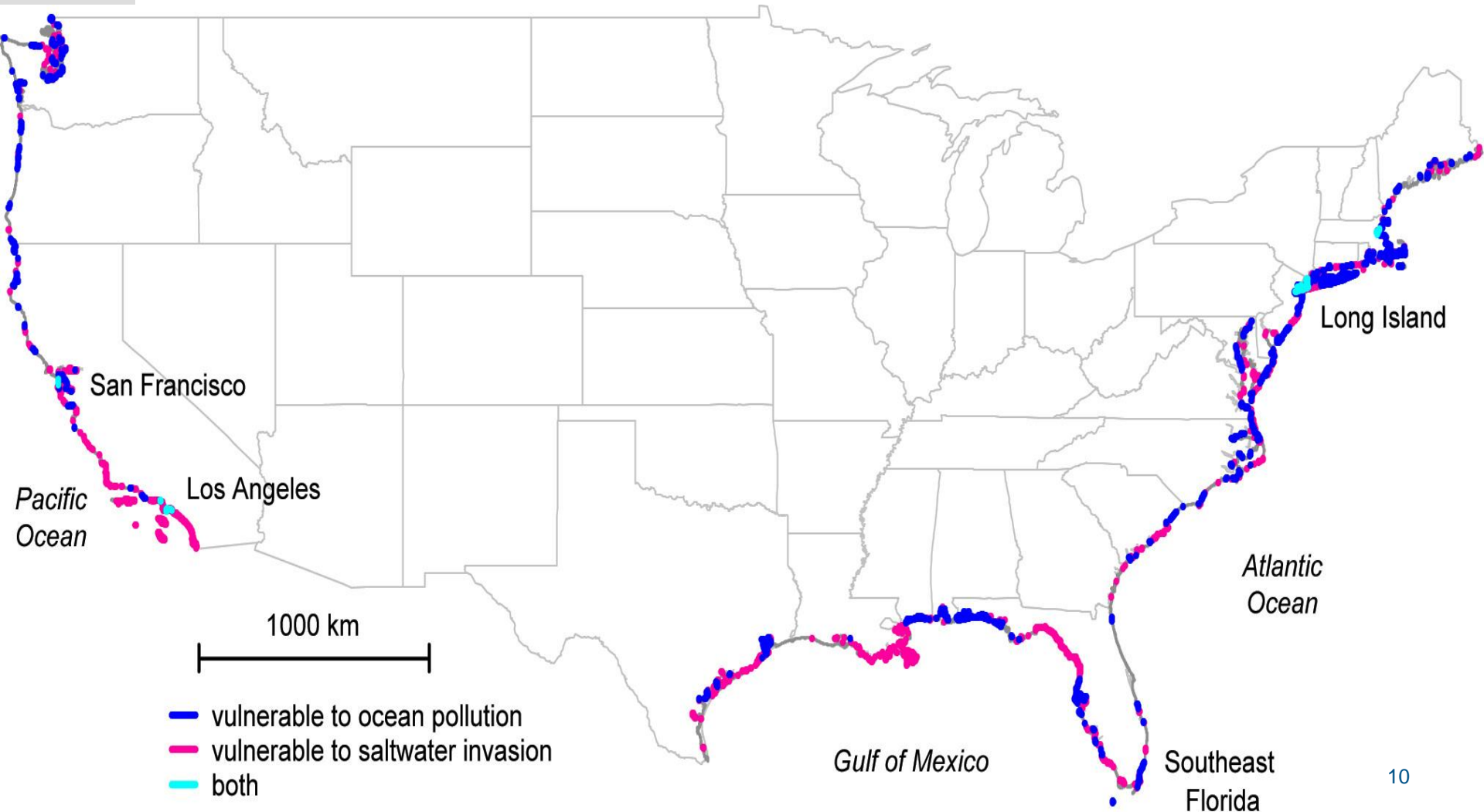


Albers equal area projection, standard parallels 29° 30' N and 45° 30' N, central meridian 96° W

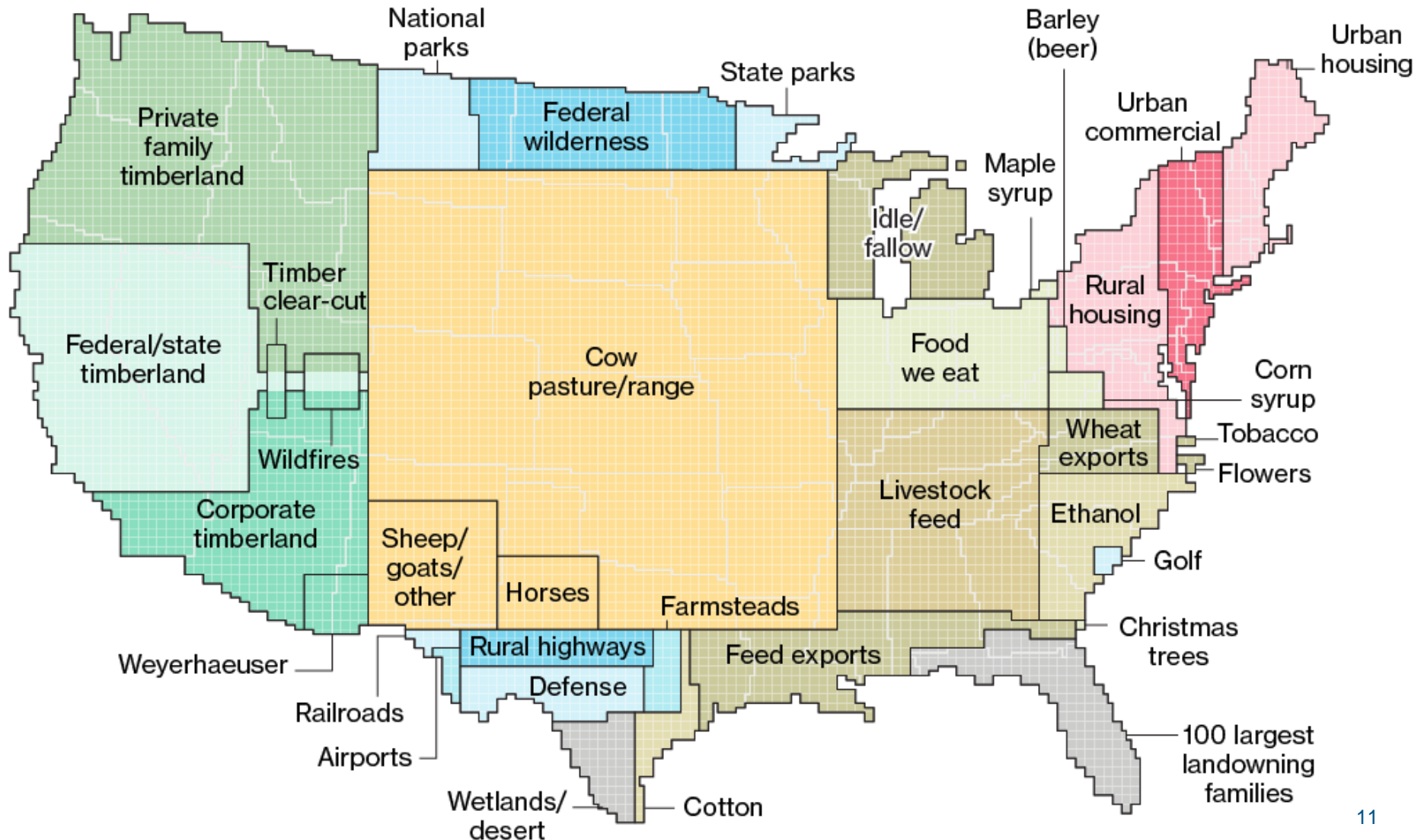
Compiled by the U.S. Geological Survey
Revised 2003

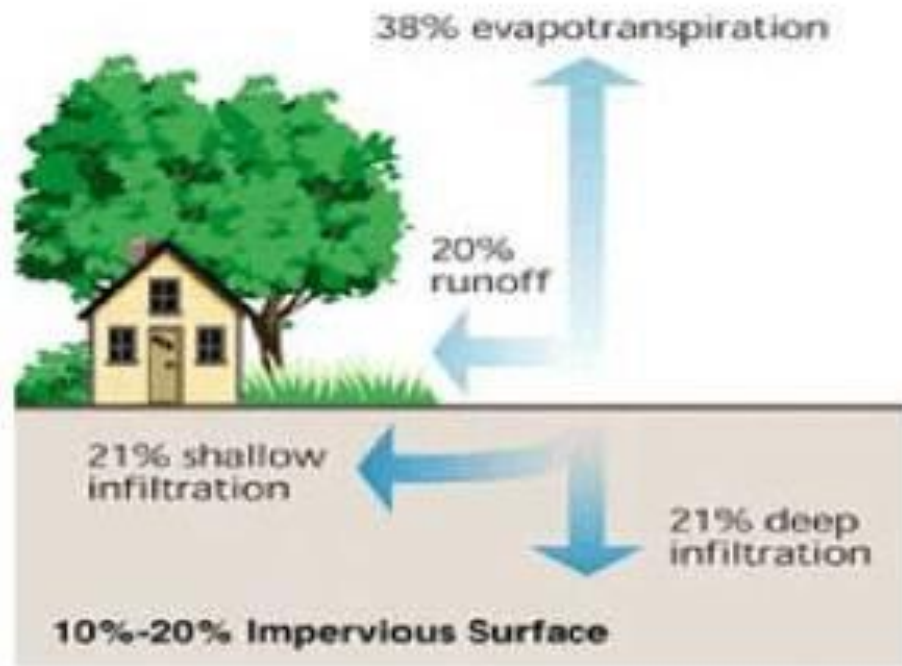
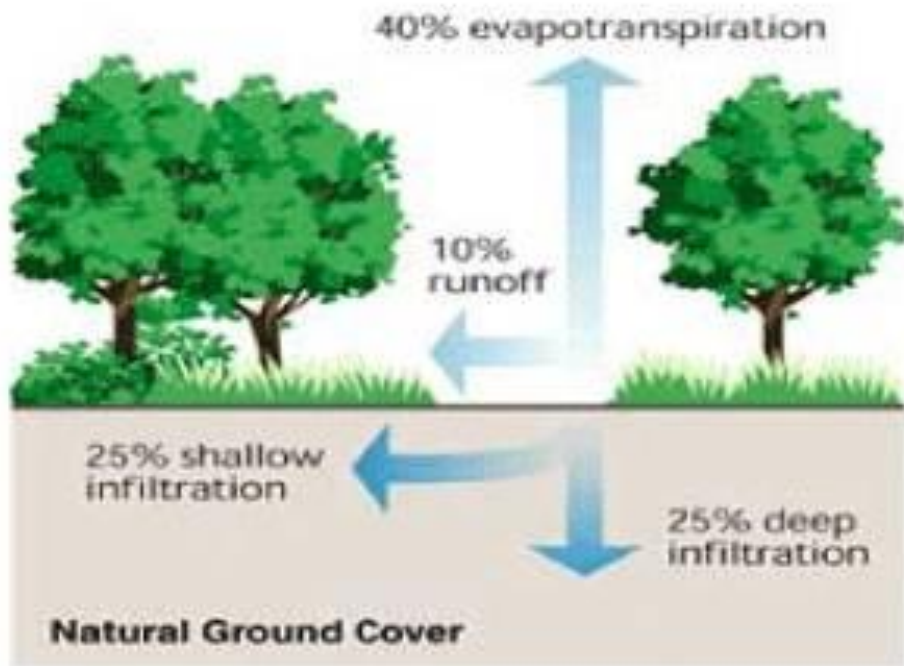


Salt Water Intrusion is a Threat to the coastlines. Groundwater declines are a threat to inland aquifers.



Another Way to look at the USA





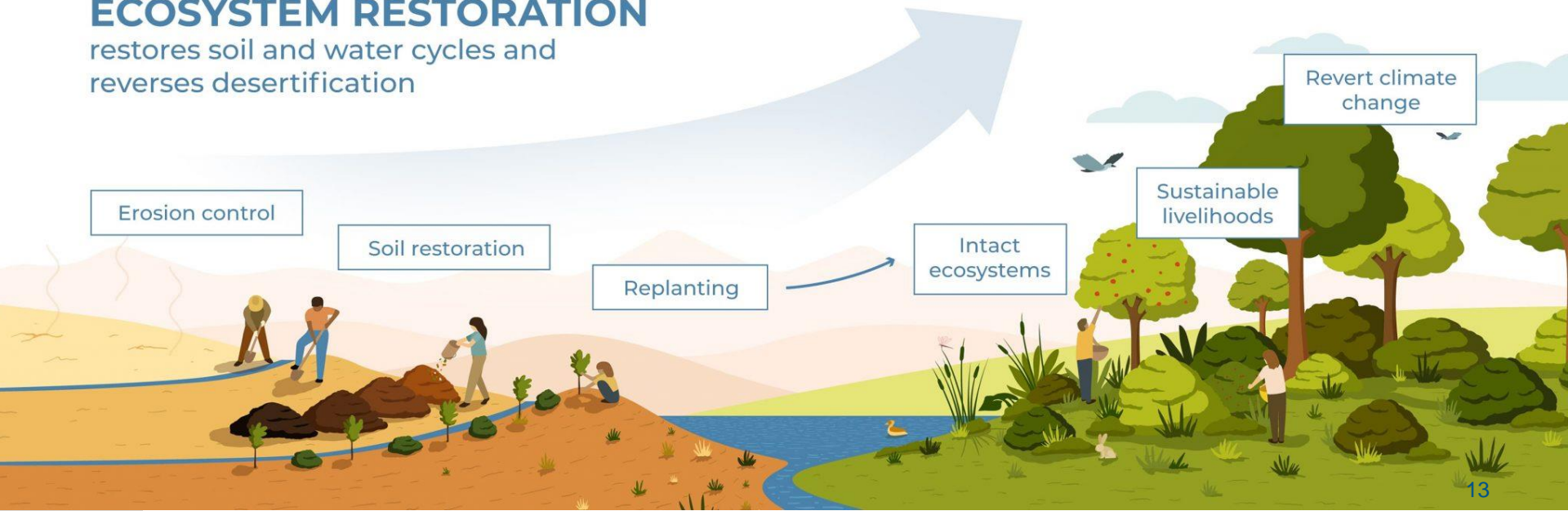
BAD LAND MANAGEMENT

leads to drought, soil erosion and desertification



ECOSYSTEM RESTORATION

restores soil and water cycles and reverses desertification



Microdetritus Berms Post Rain





Several hundred million beaver removed





Beaver lodges



Near Pakwaw Lake, Saskatchewan, Canada

Drainage direction

Jean.thie@ecoinformatics.com

Image © 2008 DigitalGlobe

©2007 Google™

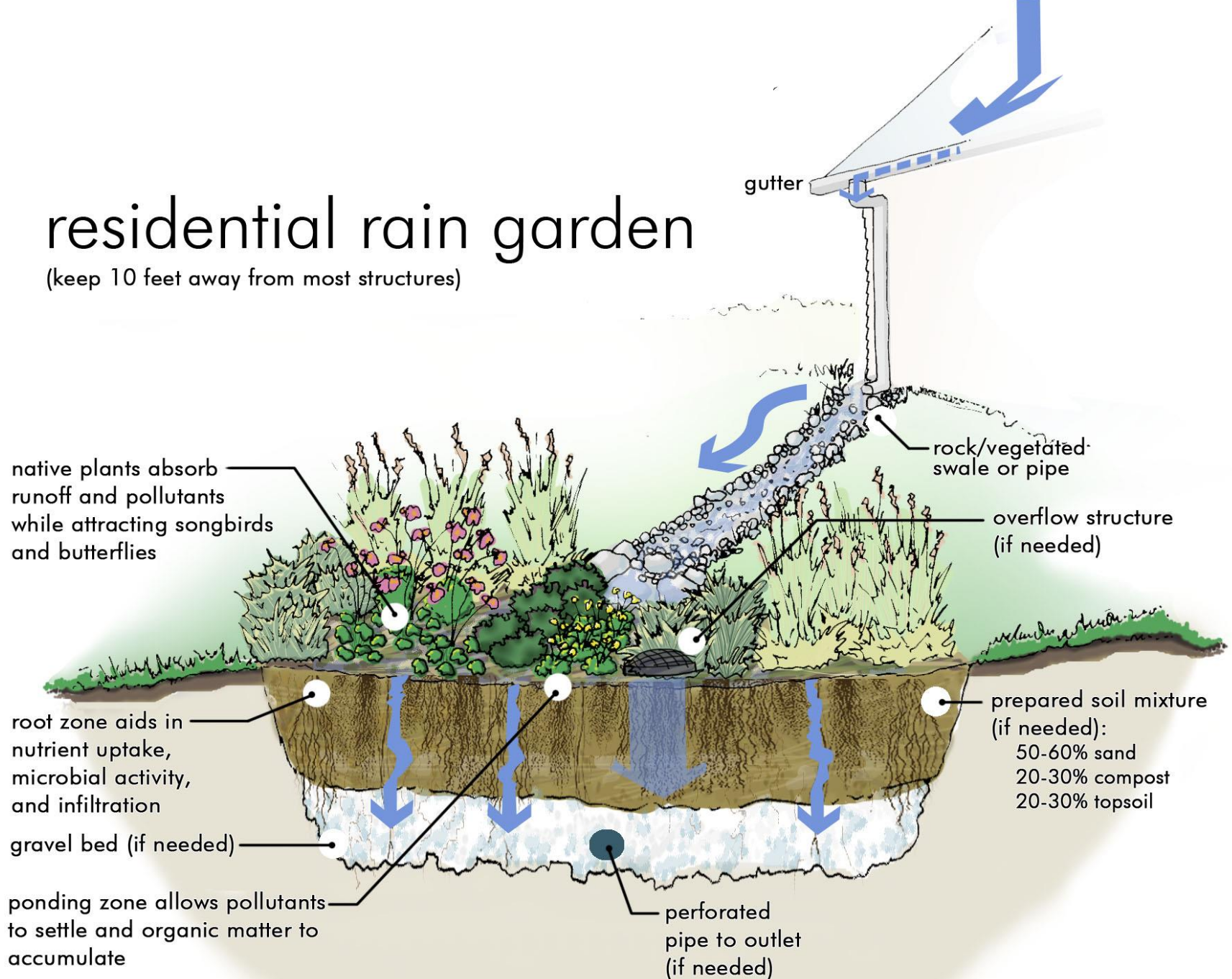
Pointer 53°28'28.30" N 102°36'32.08" W elev 294 m

Streaming 100%

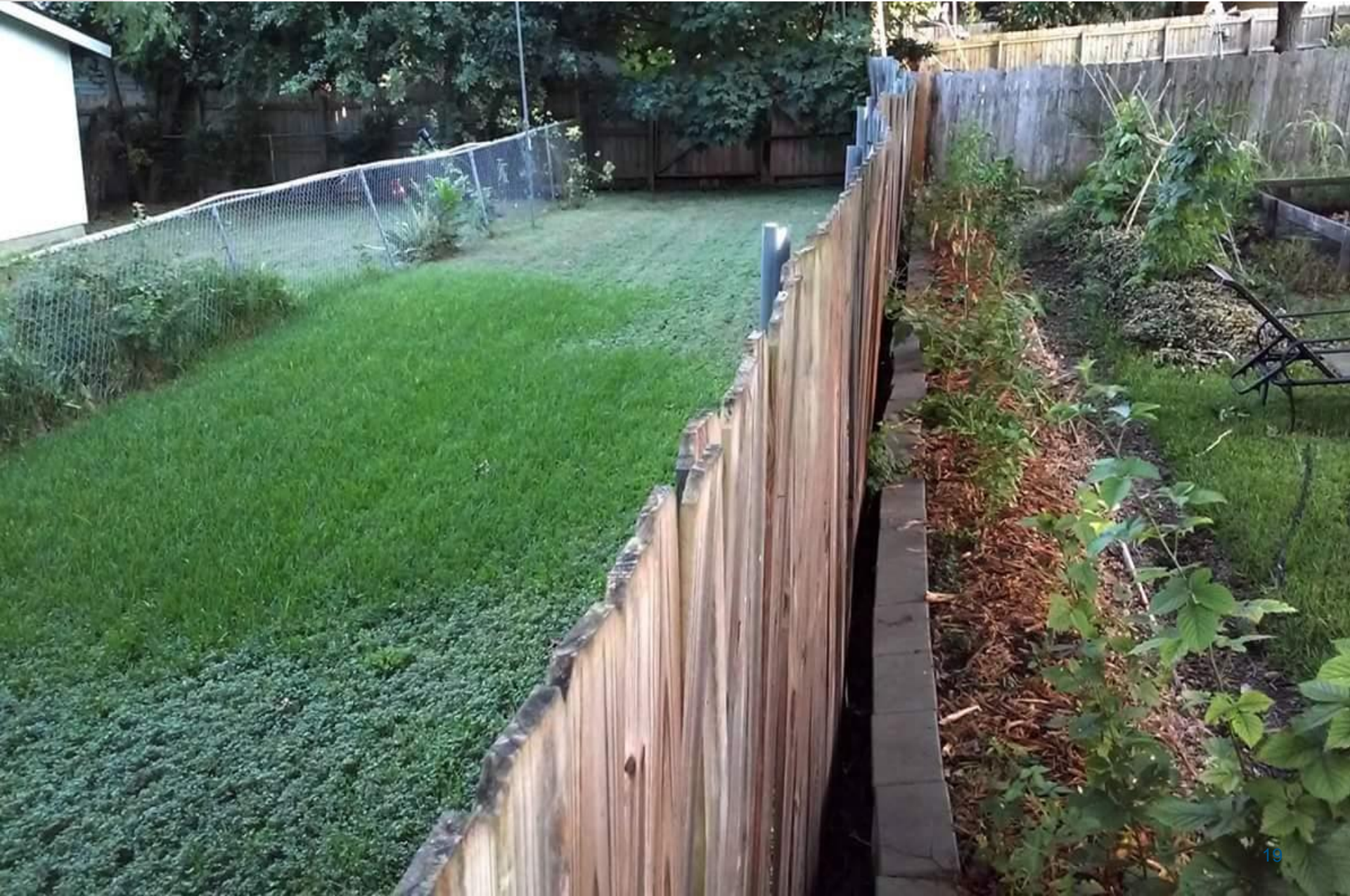
Eye alt 980 m

residential rain garden

(keep 10 feet away from most structures)



Backyard BioSwale with “Swale Plume”



Volunteer Learning Opportunity. Long Term Educational Opportunity. Community Gardens & Food Forest.



Stonebrook Estates; Houston



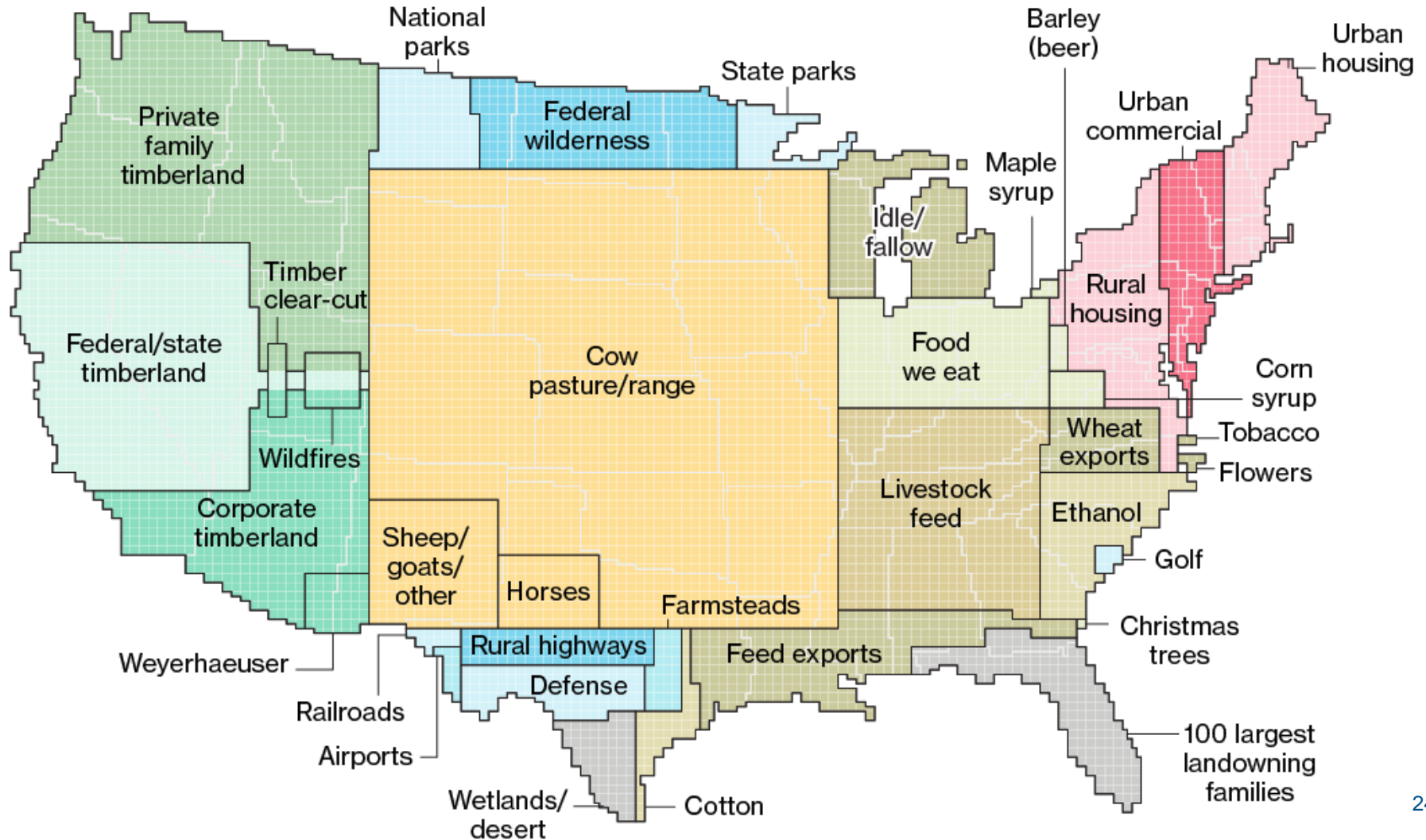
Clear Lake StormWater Wetland. TAMU.





@joe bibby

The Vast Majority of the land is Ag.





Tillage Erosion







David Bamberger;



Water From Stone



Beaver Biomimicry. BEFORE



Beaver Biomimicry. AFTER





123RF



123RF



123RF



123RF



123RF





**hugelkultur garden bed
after one month**



**hugelkultur garden bed
after one year**



**hugelkultur garden bed
after two years**



**hugelkultur garden bed
after twenty years**







What is there lots of after a storm?



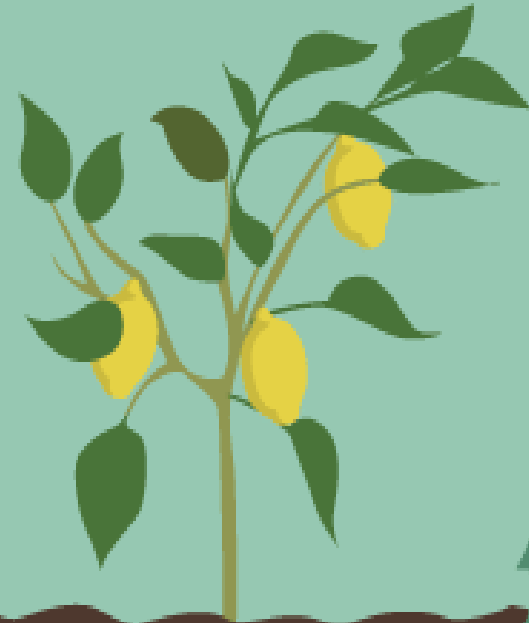
Woody Debris



Mulch vs. No Mulch

Moisture Retention and Yields

Plants grown with mulch produce higher yields than plants grown without.



Mulch

10% of rainwater evaporates



No Mulch

Up to 80% of rainwater evaporates



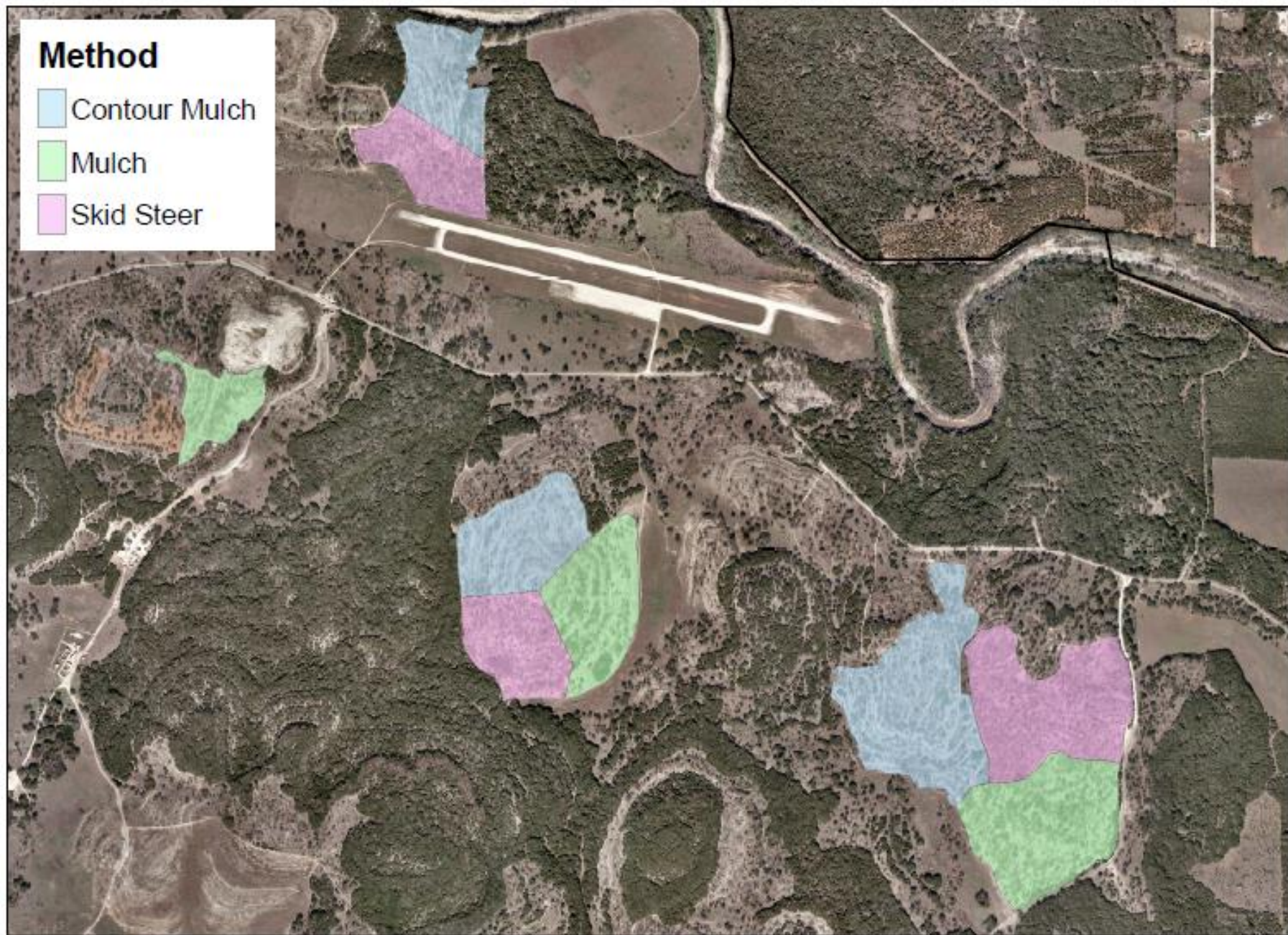
**Wood Mulch to
Wild Flowers**





Method

- Contour Mulch
- Mulch
- Skid Steer



630 315 0 630 Meters



Mulching brush/trees on contour



Contour Mulch / Beaver Biomimicry



800 acres of mulch on contour, no runoff



Slow, Spread and Sink water into uplands



Agroforestry

Working Trees for Agriculture

USDA National Agroforestry Center



Wind Breaks: Straight vs. Level





Awarded a Young

Imagery Date: 1/18/2015 30°25'14.63"



Farmers grant.

Imagery Date: 1/30/2017 30°25'14.63"

Contour Terraces, First Big Rain





2017
EPA
Green
Infrast.
Award
Winner

Terra
Purezza
Spice-
wood,
Texas₅₂



Another Young Farmer Grant



Mitigating Drought and Flooding, One Scoop at a Time.







Contour Orchards; Perennial Polyculture. Wisconsin.



Water Harvesting for Drylands: Brad Lancaster.

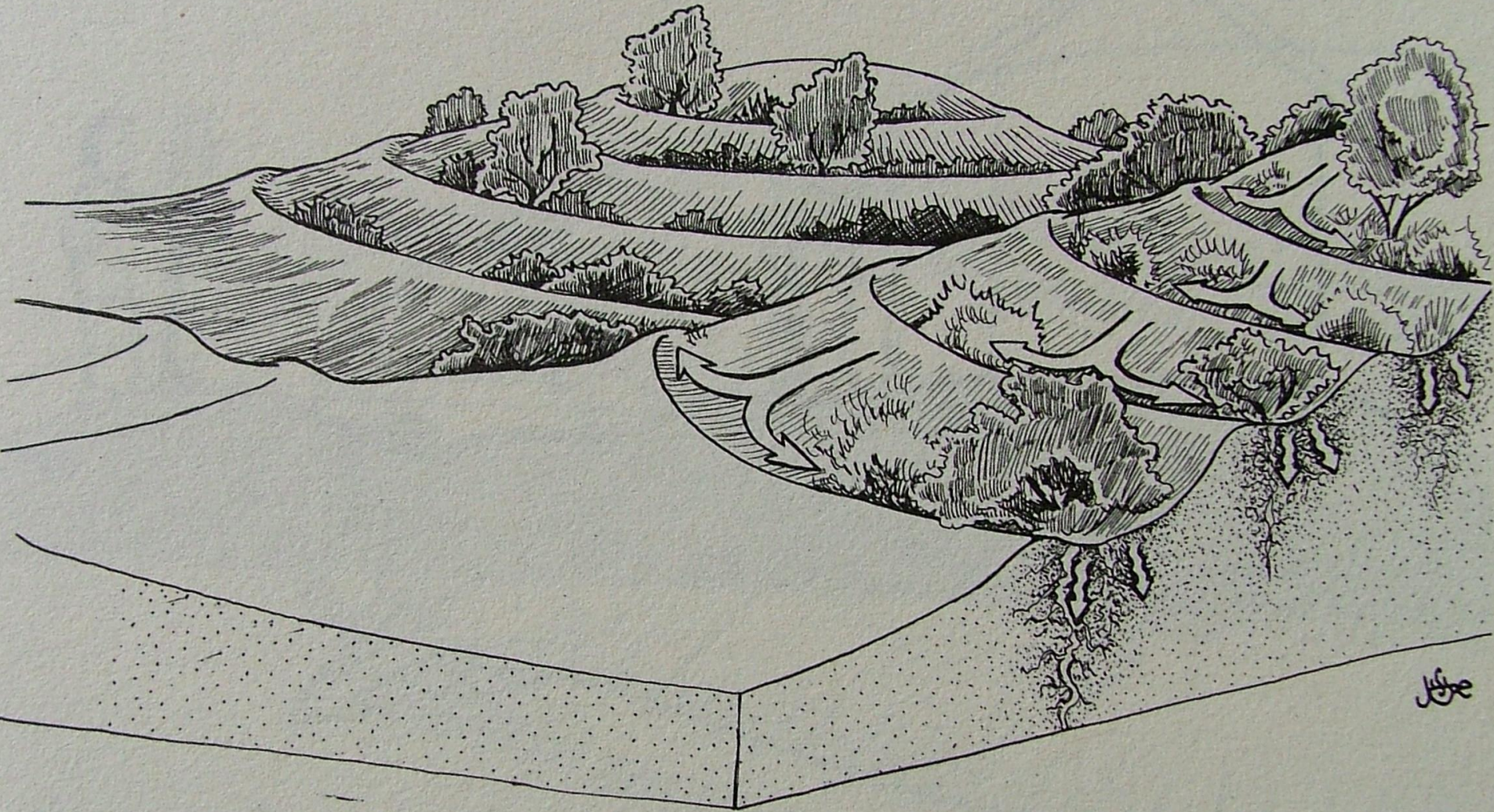


Fig. 2.20. Contour berms

“Swale Plumes” from Satellite



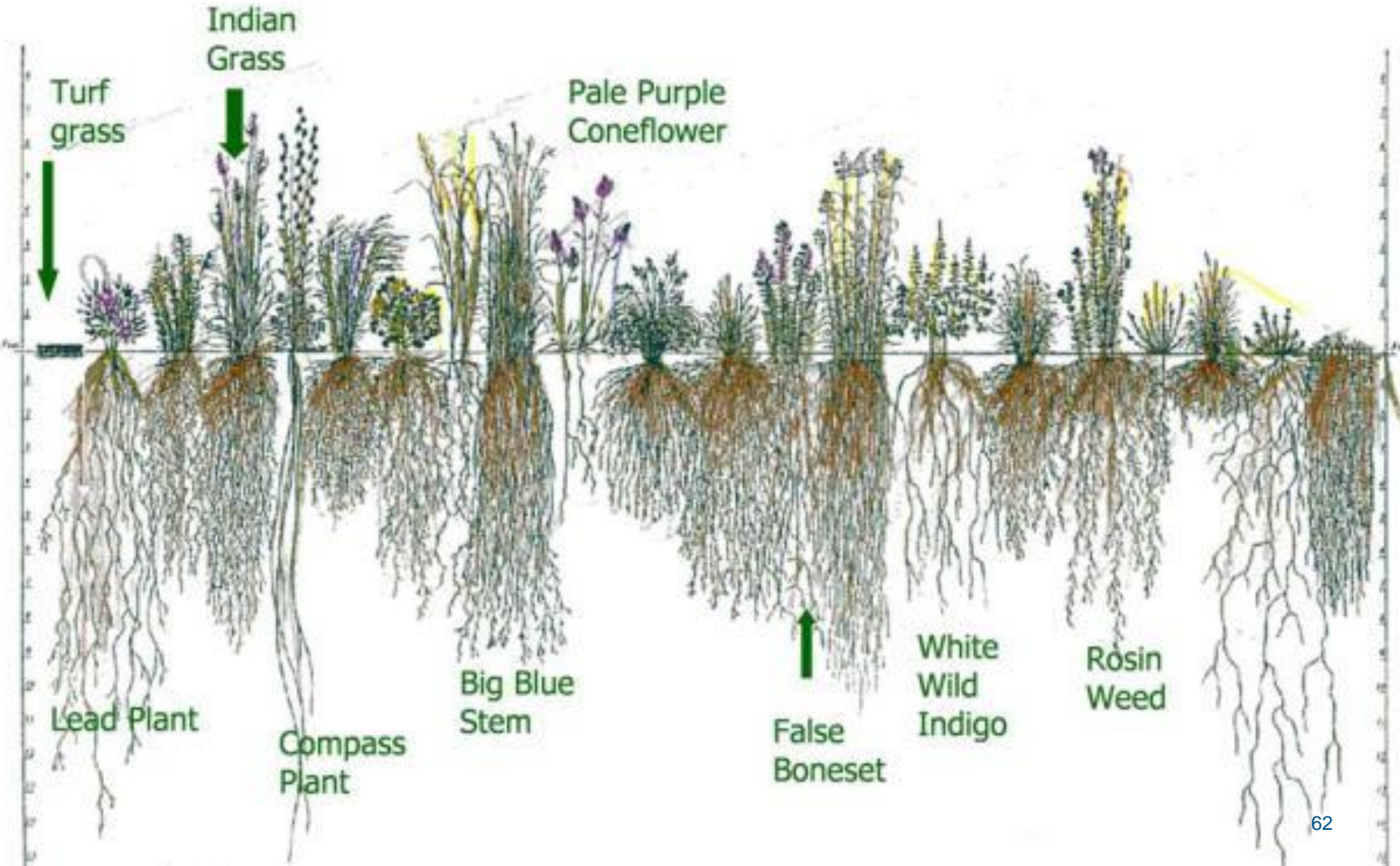


Jeff Cohen
MOONSHINE IMAGES

GI improves water quantity and quality



Native Plant Roots Run Deep





Plant
Roots
help increase
Soil Organic
Matter and
Increase
Infiltration
Rates.

27,154
gallons/
Acre Inch



NRCS “Rainfall Simulator”

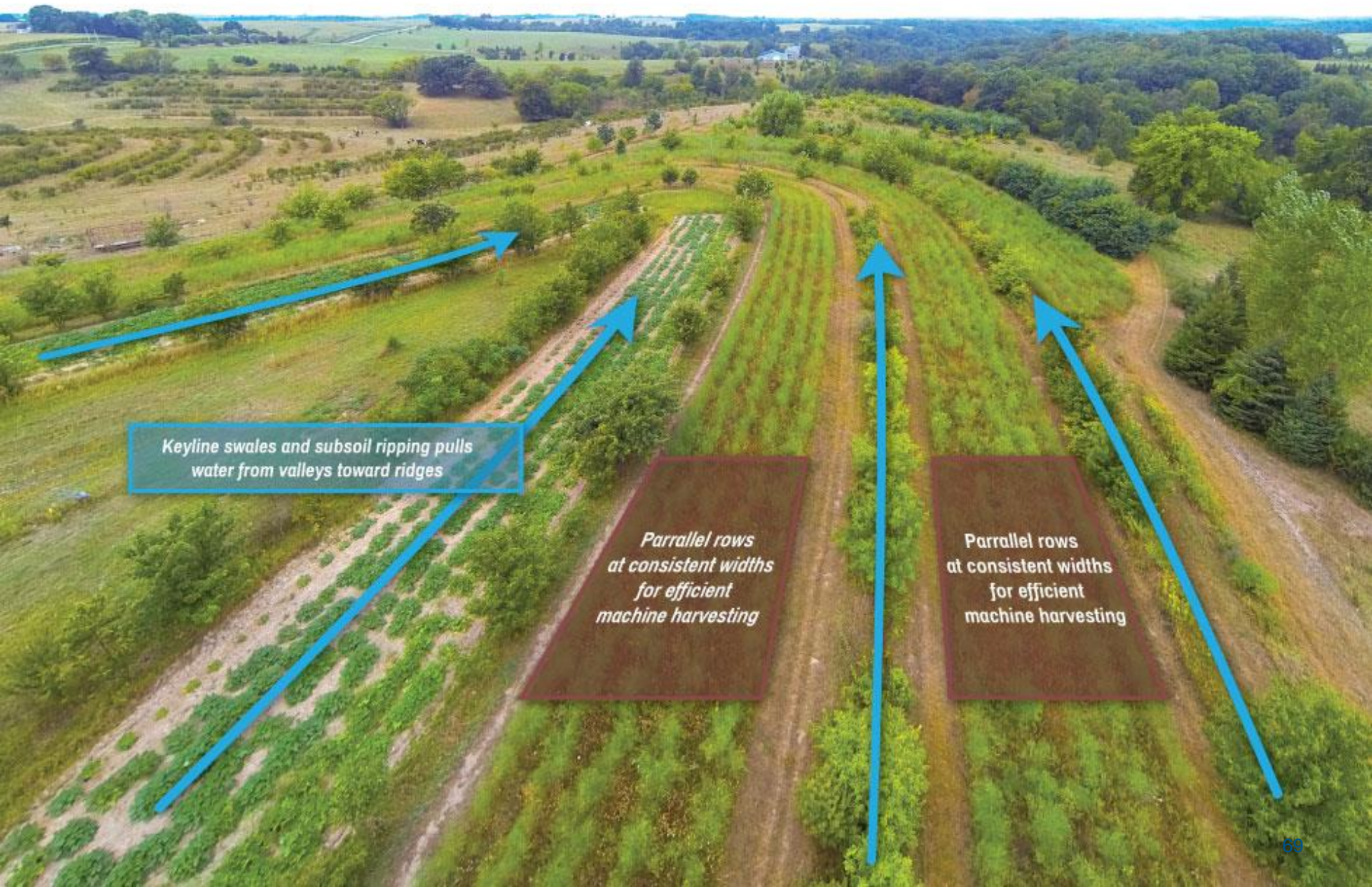








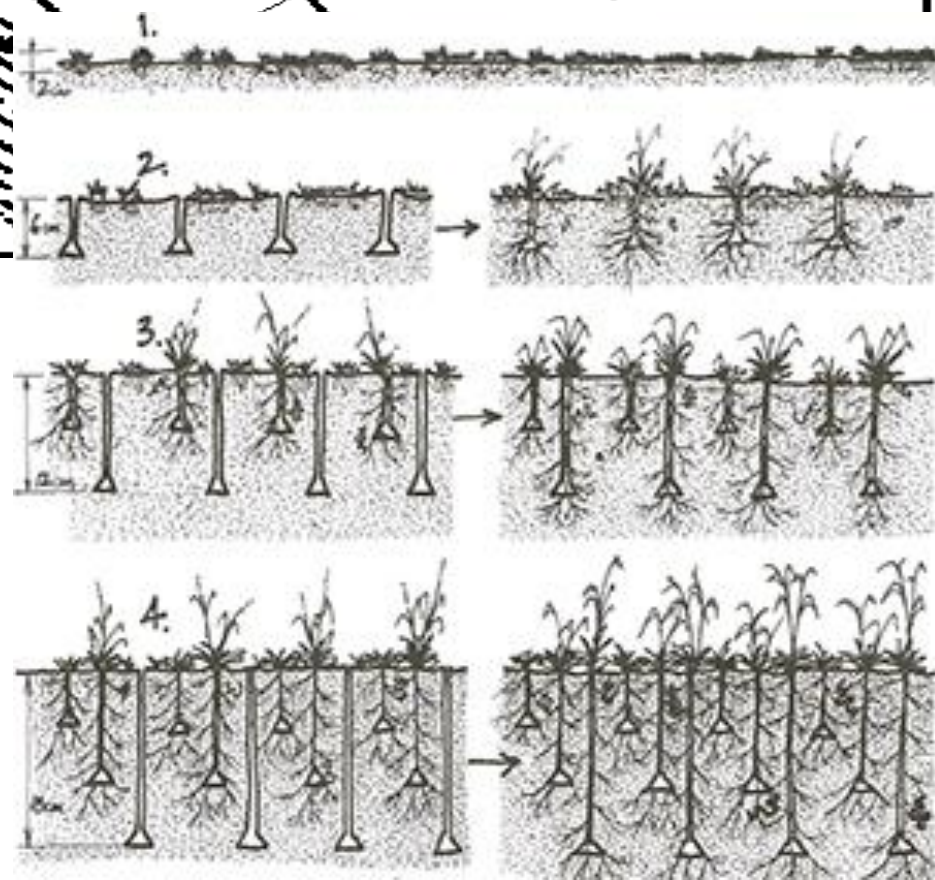
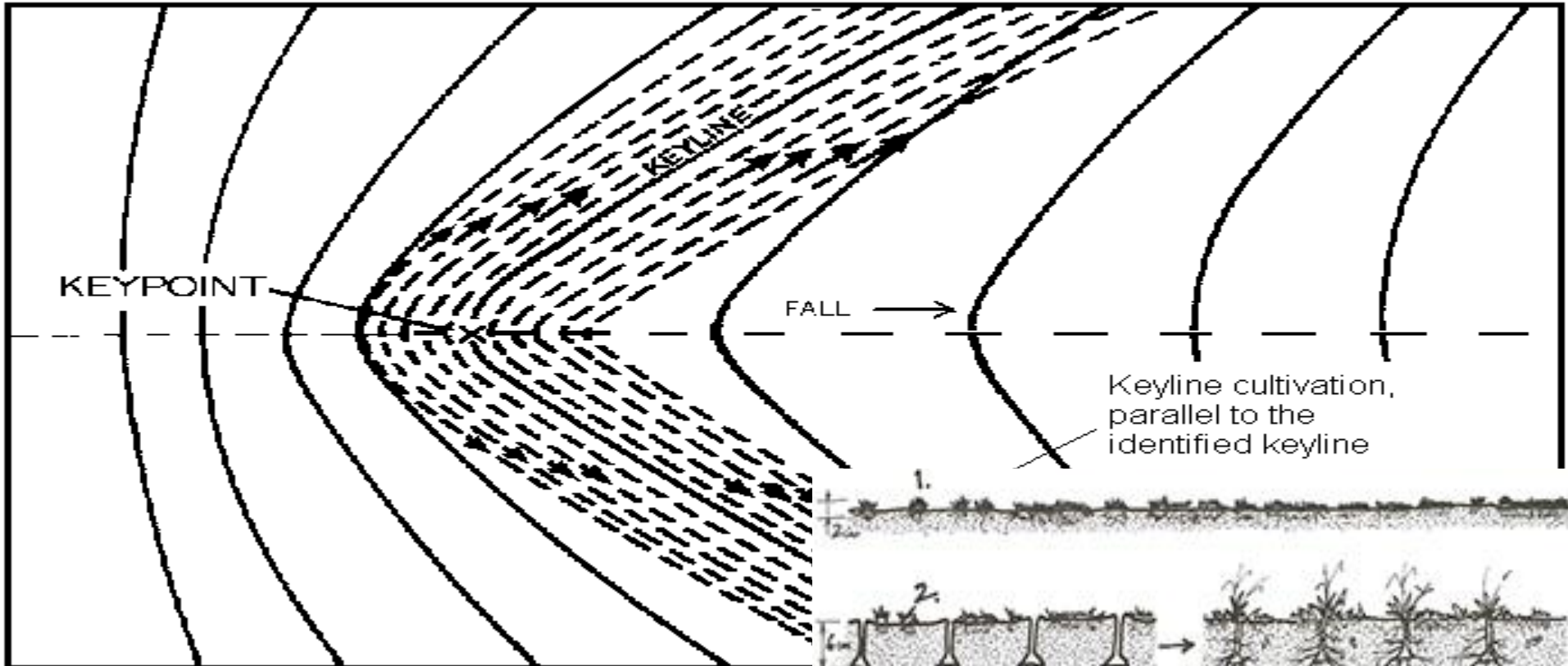
Keyline offers consistent width for crops



Keyline swales and subsoil ripping pulls water from valleys toward ridges

Parallel rows at consistent widths for efficient machine harvesting

Parallel rows at consistent widths for efficient machine harvesting







**Fort Ancient Ohio. 3.5 miles,
131 ponds, 2,000 years old.**



**2,000 Year old Green Infrastructure
Installed with Hand Tools,
1,800 years with No Maintenance**





Thank You

Bryan Hummel

Watershed Restoration and Technical Assistance

Hummel.Bryan@epa.gov

404-562-9284 desk

210-218-7915 cell

